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EXAMINER

GUERRERO, MARIA F

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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2822

DATE MAILED: 03/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/618,527

Applicant(s)

BAO ET AL.

Examiner

Maria Guerrero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is the First Action on the merits.

Claims 1-18 are pending.

Specification

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the patterned **first** photoresist layer " in line 10.

There is insufficient antecedent basis for this limitation in the claim.

Claim 10 recites the limitation "the **first** patterned photoresist layer " in line 10.

There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3-4, and 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Ngo et al. (U.S. 6,093,973).

Ngo et al. teaches forming a nitrogen-free silicon oxide layer having a refractive index of 1.47 (the extinction coefficient inherently is 0) overlying an antireflective structure, forming a patterned photoresist layer overlying the nitrogen-free silicon oxide layer (Abstract, Fig. 3, col. 2, lines 40-45, col. 4, lines 14-28, 65-67, col. 5, lines 1-4). Ngo et al. is silent about the nitrogen-free silicon oxide layer serving as a protective layer and removing the patterned photoresist layer. However, the nitrogen-free silicon oxide layer serving as a protective layer and the step of removing the patterned photoresist layer are inherent because necessarily flows from Ngo et al. reference. Ngo et al. shows the oxide as a hard mask and forming metal interconnections; therefore, the patterned photoresist layer is removed and the nitrogen-free silicon oxide layer is serving as a protective layer (Abstract, col. 6, lines 25-45).

Ngo et al. discloses the antireflective structure having one silicon oxynitride layer as conventional in the art (col. 1, lines 40-45). Ngo et al. teaches the nitrogen-free silicon oxide layer having a thickness of no greater than 350 angstroms and being

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formed by plasma enhanced chemical vapor deposition (col. 2, lines 57-60, col. 4, lines 41-45).

The claiming of a new use, new function or unknown property, which is inherently present in the prior art, does not necessarily make the claim patentable. In re Best, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977).

The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e., identity of terminology is not required. In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 5 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ngo et al. (U.S. 6,093,973) in view of Lee et al. (U.S. 6,376,392) and Xu et al. (U.S. 6,656,837)

Regarding claims 5 and 9, Ngo et al. discloses employing SiH₄ to form the nitrogen-free silicon oxide layer (col. 4, lines 50-60).

Ngo et al. does not specifically show using CO₂, the nitrogen-free silicon oxide layer being a silicon oxycarbide layer. However, Xu et al. discloses employing a silicon

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oxycarbide layer below the photoresist layer and using CO₂ (col. 6, lines 58-62, col. 8, lines 40-60).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Ngo et al. reference by using CO₂ and the silicon oxycarbide layer as taught by Xu et al. in order to reduce photoresist poisoning (Xu et al., col. 2, lines 25-29).

6. Claims 2 and 10-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ngo et al. (U.S. 6,093,973) in view of Lee et al. (U.S. 6,376,392) and Xu et al. (U.S. 6,656,837).

Ngo et al. teaches forming a nitrogen-free silicon oxide layer having a refractive index of 1.47 (the extinction coefficient inherently is 0) overlying an antireflective structure, forming a patterned photoresist layer overlying the nitrogen-free silicon oxide layer (Abstract, Fig. 3, col. 2, lines 40-45, col. 4, lines 14-28, 65-67, col. 5, lines 1-4). Ngo et al. is silent about the nitrogen-free silicon oxide layer serving as a protective layer and removing the patterned photoresist layer. However, the nitrogen-free silicon oxide layer serving as a protective layer and the step of removing the patterned photoresist layer are inherent because necessarily flows from Ngo et al. reference. Ngo et al. shows the oxide as a hard mask and forming metal interconnections; therefore, the patterned photoresist layer is removed and the nitrogen-free silicon oxide layer is serving as a protective layer (Abstract, col. 6, lines 25-45). Ngo et al. teaches the nitrogen-free silicon oxide layer having a thickness of no greater than 350 angstroms

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and being formed by plasma enhanced chemical vapor deposition (col. 2, lines 57-60, col. 4, lines 41-45). Ngo et al. discloses employing SiH_4 to form the nitrogen-free silicon oxide layer (col. 4, lines 50-60).

Ngo et al. does not specifically show the dielectric anti-reflective layer as being nitrogen-free. However, Lee et al. shows the use of the nitrogen-free dielectric anti-reflective layer as well known in the art (Abstract, col. 1, lines 60-63, col. 2, lines 51-55).

Ngo et al. does not specifically show using CO_2 , the nitrogen-free silicon oxide layer being a silicon oxycarbide layer, the nitrogen-free silicon oxide layer being formed insitu. However, Xu et al. discloses employing a silicon oxycarbide layer below the photoresist layer, the nitrogen-free silicon oxide layer being formed insitu, and using CO_2 (col. 6, lines 58-62, col. 8, lines 40-60).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Ngo et al. reference by including the nitrogen-free dielectric anti-reflective layer as taught by Lee et al.; the nitrogen-free silicon oxide layer being formed insitu, using CO_2 , and the silicon oxycarbide layer as taught by Xu et al. in order to avoid footings and to reduce photoresist poisoning (Lee et al., col. 2, lines 24-27; Xu et al., col. 2, lines 25-29).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yu et al. (U.S. 6,057,218) and Tao et al. (U.S. 6,174,818) (Fig. 3-5, col. 2, lines 53-60) are cited as evidence to show that the nitrogen-free silicon oxide layer serving as a protective layer and the step of removing the patterned photoresist

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layer are inherent from Ngo et al. reference. Yu et al. shows the hard mask oxide layer as protecting the underlayer during the step of removing the patterned photoresist layer (Fig. 2e-2h, col. 4, lines 57-60, col. 5, lines 20-25). Fujisawa et al. (U.S. 6,395,973) is cited as evidence to show that the nitrogen-free silicon oxide layer taught by Ngo et al. inherently has an extinction coefficient of 0 (col. 5, lines 65-67, col. 9, lines 1-2, col. 14, lines 30-33). Cheung et al. (EP 0840361 A2) shows employing a silicon oxide hard mask having low nitrogen between an anti-reflective layer and photoresist layer and varying the thickness of silicon oxide hard mask from 0 to 1000 angstroms (col. 5, lines 35-40, col. 22, lines 25-36). Bao et al. (U.S. 6,174,797) teaches several steps pertinent to applicant's disclosure.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Maria Guerrero
Primary Examiner
February 4, 2004